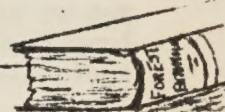
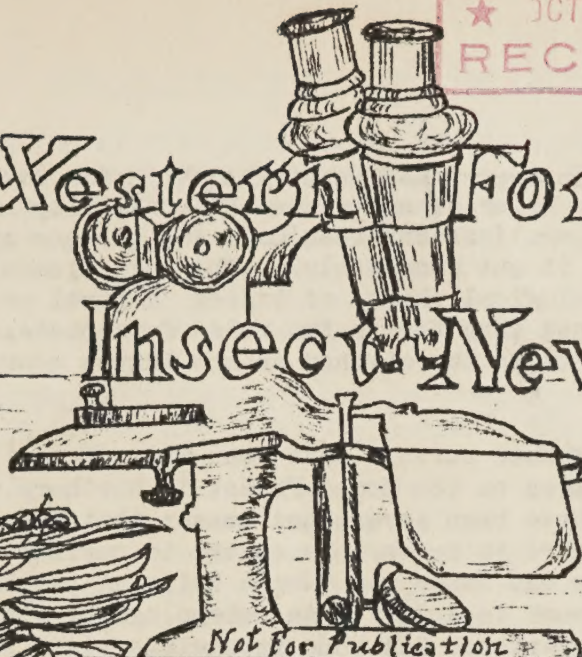


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FORECASTING INSECT EPIDEMICS

By

J. M. Miller

As the old issue "to control or not to control" was dragged out into the open again in our last number, I am strongly tempted to give the topic another airing, even at the risk of overworking a perfectly good subject for leading articles. The issue involved is one that comes up frequently in field projects, and often we find it one that can neither be avoided nor answered to our satisfaction.

Keen has suggested the conditions under which an offensive against insect depredations seems to be entirely warranted by the forest values at stake. Successful control work will undoubtedly pay the owner who is losing valuable stumpage faster than it is being grown. It can also be considered a benefit where dead trees are spoiling the esthetic and recreational values of areas that are being protected for playground purposes.

However, there is still another angle of the problem which concerns particularly the entomologist. Where the values warrant protection, what will be the probable course of an epidemic if no control work is done? An infestation that is certain to increase for the next two or three years demands much more drastic action than one which is about to subside from natural causes.

I once had an experience on a fire which for several days baffled all efforts to bring it under control. Finally after special plans and preparations had been made for another attempt, a rain came on that put it out completely. The same element of chance enters into the entomological phases of insect control projects. As yet we have not advanced very far in the role of prophets, either in long term predictions as to the weather or the future course of an insect epidemic.

Since 1922 annual surveys have been made of a situation extending over a large area on the Modoc Forest in Northern California. Barkbeetle epidemics have been severe and losses that occurred in 1922 were considered by owners to be serious enough to warrant action. But the question raised by one owner was "Won't this bug trouble die out anyway if no control work is done?" An entomologist, sizing up the situation from past experience and some intangible sixth sense predicted that losses would probably decline in 1923. They did. But in 1924 along with a pronounced dry season, the beetles came back. In 1925 there was a return to normal precipitation and according to the dope sheet the beetles should have subsided again. Instead they kept increasing. The 1926 losses will be the heaviest in the history of the area. On certain sections the amount of timber recently killed amounts to more than 25% of the stand.

Where control work is to be adopted for the present we will have to accept on faith the proposition that by destroying the brood in one tree we stop its spread and the probable loss of another tree, just as we fight fire as a menace without waiting for some weather change to determine the course of action.

However, we have already discovered certain tendencies that give us some indications of what we can expect. For example, it is pretty well settled that barkbeetle epidemics in mixed stands are likely to be less severe and of shorter duration than those in pure stands. Outbreaks developing from windfalls, burns, and slash are usually sporadic and subside within a year or so. Climatic influences and the relative abundance of bird and insect predators give some basis for predicting probable increases or decreases. The further advance of research work along this line will no doubt make the forest entomologist much less of a gambler in forecasting the future. But for the present we are obliged to recommend control measures mainly on the basis of conditions as they exist on the ground at the time rather than on what we can expect them to be in another year.

THE RELATION OF FIRE AND ONE INSECT.

The relation of fire and insects has been discussed for a number of years without any very definite conclusions being drawn that satisfies both the forester and the forest entomologist. There is one insect, however, which appears to follow the fire and to delight in the smoke and heat. Apparently it will attack any tree that is scorched.

This insect is one of the flatheaded borers, Melanophila atropurpurea. For a number of years western entomologists have been considering it the same as Melanophila acuminata but the real fire eater differs from acuminata in having the wing covers tipped with a distinct spine.

During June 1924, an entire hillside of timber near Northfork, Calif., was thoroughly scorched by fire. By August 1st, practically all of this timber was heavily infested with broods of various insects. Sections of wood were collected and Melanophila atropurpurea was reared in numbers from the following: canyon live oak, California balck oak, mountain mahogany, and incense cedar.

On November 16, 1919, Mr. F. B. Herbert found hundreds of beetles of this species flying around a brush fire near Los Gatos. Numerous beetles were crawling on scorched willow branches that were still hot and smoking. Apparently it is the scorching that attracts the insects and not any particular quality of the host tree.

H.E.Burke

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WHY DO FIRES INCREASE BEETLE LOSSES?

One of the most serious aftermaths of summer fires in western yellow pine timber is the heavy killing of scorched trees by barkbeetles. Records of 1000% increase in beetle activity have been made. A recent survey of a burn which occurred in July 1924 on Timber Mountain of the Modoc National Forest showed that a great increase in beetle loss occurred in the two years following the fire and that in 1926 the loss on the burn averaged 1120 beetle-killed trees per square mile while on adjacent unburned forest the loss averaged 300 trees per square mile. What are the reasons for this?

Measurements on thousands of pairs of cores from beetle-killed trees and adjacent trees of similiar diameter have pretty conclusively shown that the beetles prefer the slow growing trees. On the burned area of Timber Mountain, cores from the remaining live trees showed that their growth had been retarded in about the proportion that their leaf surface had been destroyed. Trees with one quarter of the foliage killed showed one quarter normal growth; those with one half of the foliage gone only one half normal growth; and those with all the foliage killed showed no growth at all even though the cambium was still green. The result has been that the beetles, prefering as they do slow growing trees, have attacked great numbers of these scorched trees with their retarded growth; and increased the original destruction of the fire many fold. This, of course, does not answer the question "why they attack slow growing trees?" but it shows that the beetles are at least consistent in their preference.

F.P.Keen.

HIGH BEETLE MORTALITY ON THE KAIBAB.

During the period from 1920-1924 the Black Hills beetle killed many thousands of trees on the Kaibab National Forest. Studies conducted there during the summer of 1925 showed a reduction of about 90% in the number of trees killed by that year's attack. The studies this past summer show an even greater reduction so that at present there is no epidemic on the Kaibab.

Studies of the brood made June 12-17, 1926, showed an average brood (based on 1522 sq. ft.) of 8.65 per sq. ft., while the beetles attacking this same area of bark average 11.30 - a deficiency in brood of 2.65 per sq. ft. A count of the brood in 794 sq. ft. of bark just one month later (July 12-17) gave an average brood of 2.32 per sq. ft. average attacking beetles 11.01 per sq. ft. - a brood deficiency of 8.69 per sq. ft. This would indicate a brood mortality of 73 per cent during the month intervening between the two studies.

Last year's brood counts conducted during July gave an average brood of 5.32 per sq. ft. and was correlated with a reduction of about 90% of the infestation. The counts in July 1926 indicated that we could expect less than one per cent as much infestation as in 1924. This expectation was fully realized and at present trees killed by the 1926 flight of beetles are very difficult to find.

This remarkable reduction in the beetle population of the Kaibab is believed to be due to the effects of the continued dry weather during the summer, the continual activity of natural enemies and to the cumulative effects of adverse conditions.

M.W. Blackman.

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FINE WEATHER A GREAT BENEFIT TO BARK BEETLES.

Due to the long open season, *Dendroctonus monticolae* developed a summer generation on the Modoc National Forest this year. New adults were found emerging in September from a number of trees.

The western pine beetle developed two complete summer generations this year on the Modoc Forest at an elevation of 4,600 feet.

F.P. Keen

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BARK BEETLES ALMOST HUMAN.

September 3rd, near Sylvan Pass, Yellowstone National Park, were found a number of adults of the balsam fir beetle (*Dryocoetes confusus*) in the bark of a lodgepole pine log. This log was one of numerous lodgepole and alpine fir logs used in building a cabin. Evidently in this case the beetles were human enough to make the mistake of getting into the wrong pew.

H.E. Burke.

PANDORA INFESTATION HAS DISAPPEARED.

A survey of the infested yellow pine areas on the Klamath Indian Reservation made during August 1926 indicates that the Pandora moth has disappeared. No living specimens of any stage of the pest could be found. This is a striking contrast to the last few years when numerous specimens could be found almost anywhere and many trees showed every indication of severe defoliation.

J.E. Patterson.

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CHRYSOBOTHRIIS TEXANA AS A SHADE TREE PEST.

During the past few years this species of flatheaded borer has been reported from several localities in Texas and Oklahoma as a pest of the Eastern red cedar (*Juniperus virginiana*) where this tree is used for shade and ornamental purposes. The borer kills the tree by mining the inner bark and outer wood of the main trunk. Sometimes it is associated ^{with} by the Eastern cedar bark beetle (*Phloeosinus dentatus*).

Chrysobothris texana is found in various species of Juniper throughout the entire southwestern part of the United States. We have specimens from the Garden of the Gods, Colorado; Lambert, Oklahoma; Dallas, Texas; Indianola, Utah; Kaibab Forest, Ariz.; and San Bernardino County, Calif.

H.E.Burke.

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YELLOW PINE LUMBER DAMAGED BY ROUNDHEADED BORERS.

Some recent shipments of lumber from the Susanville district caused quite a stir among the purchasers who discovered that the stock included some healthy woodboring grubs in about the right condition for fish bait.

An inspection was made on Sept. 21 and 22 of the yards from which this material was shipped. The insect responsible was found to be Callidium antenatum, a roundheaded borer which usually occurs in the limbs of dead trees and has been known to cause some damage to rustic work by loosening the bark. The trouble at the mill was confined entirely to grades which had been seasoned in the yards with bark strips adhering to the wood. The eggs are laid in bark crevices early in the season and the larvae work between the bark and wood during the summer months. Before they mature in the fall an overwintering gallery is formed which extends for several inches into the wood. It is the overwintering gallery that causes most of the damage to lumber.

This damage can be avoided by clean edging all of the boards or by screening the lumber stock during the period while eggs are being deposited.

J.M.Miller.

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MODOC BEETLE SURVEY.

A pine beetle reconnaissance is now being made of the Happy Camp-Lava Bed District of the Modoc National Forest by F.P. Keen and W.J. Buckhorn. The very heavy losses in western yellow pine caused by the western pine beetle during recent years has been a source of much worry to the owners of the timber, both Federal and private. The present survey is being made to assist the owners in determining what is the best course of action to follow in order to reduce these losses or salvage the dead timber. The expenses are being paid by the Forest Service; the Bureau of Entomology paying the salaries.

So far the survey has shown a tremendous increase in infestation for the years 1924, 1925, and 1926. Through some of the best stands groups of fifteen to thirty mature trees have been killed by the summer generation of 1926 and no decrease is as yet in sight. On an area near the ice caves a 100% marking of all dead and live trees in a mile strip, five chains in width showed that 25% of all trees over 6" in diameter had been killed during the last five years. Similiar strips on other areas gave similiar results. One strip showed that 35% of all trees over 30 inches in diameter had been killed in recent years.

F.P. Keen

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JEFFREY PINE BEETLE DEVELOPING ON INYO WINDFALL.

The effects of the storm that visited the east side of the Sierra Nevada Mountains in February, 1923, will be seen on the Mono and Inyo forests for some years to come. The volume of merchantable timber that was blown down during the few hours while the great wind lasted is difficult to estimate but there is no doubt but that it runs into millions of feet.

The insects that took advantage of the vast amount of windblown material for a breeding ground were slow in establishing themselves. During 1923 and part of 1924 a series of generations of Ips oregonus multiplied in the down tops and logs. In the late fall of 1924 these insects suddenly attacked thousands of standing trees on the windfall areas. Tops of large trees and entire lengths of small trees were killed by this outbreak. However, this attack marked the end of the Ips epidemic as it died out in 1925 and in the examination just completed in September, 1926, I failed to find any Ips attack anywhere.

In 1925, the Jeffrey pine beetle (Dendroctonus jeffreyi) was found attacking the underside of logs of trees which had been turned over by the wind with half of the root system still in the soil. This insect increased very slowly during 1923 and 1924 but in the fall of 1925 there was a heavy attack on standing trees over the entire area. The 1926 attacks will run into several hundred trees per section. This is the heaviest infestation of the Jeffrey Pine beetle of which we have any record and we have yet to determine how long it will persist.

J.M. Miller,

STATION HAPPENINGS.

Coeur d'Alene, Idaho.

Evenden spent August and September making an extensive survey of the Bitterroot and Bighole areas in Western Montana. The purpose of the survey was to determine the amount of mountain pine beetle infestation in the lodgepole pine on the areas. All of the observations made indicate that the insects are still plentiful and that the beetles undoubtedly fly for long distances. During the last of September snow and zero weather added to the pleasures of the survey.

Gibson has been located all summer on the East Fork of the Bitterroot River making an intensive study of the mountain pine beetle in lodgepole pine. Many interesting facts concerning the habits of the insect have been discovered. These will be worked up this winter and given to the readers of the "news" from time to time.

During August and September, Rust has been engaged in an intensive study of the mountain pine beetle in western white pine near Coeur d'Alene, Idaho. The study consists of counts of the new attacks, counts of the larvae and observations on the seasonal history, parasites, etc. To get the data desired infested trees are felled and a strip of bark is removed for study every ten feet along the trunk. Such intensive work is rather tedious and takes considerable time, several days being required for each tree.

J.C. Evenden.

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Northfork, Calif.

September 18, Person gave a talk on forest insects at a meeting of the Ahwahnee Valley farm center of Madera County. Considerable interest was exhibited in the subject and a number of those present expressed their appreciation of the work being conducted at Northfork.

Person and Wagner have finished the cruise of the Cascadel unit and are now working on the permanent sample plot established to determine the kind of trees selected by the western pine beetle.

There has been a marked reduction in the western pine beetle infestation over that of last year. The peak of the infestation was reached in the summer of 1925, the winter loss being not over 1/3 of the summer loss.

Dendrograph records showing the dying of a western pine beetle infested trees has been secured.

H.L. Person.

Palo Alto, Calif.

Dr. M. W. Blackman finished the season's work on the Kaibab and is now at Palo Alto for the winter. As soon as the Kaibab data has been placed in final form Dr. Blackman will spend his time in taxonomic work on the Scolytidae.

Mr. J.M. Miller spent September in a survey of insect conditions on the Inyo windfall and in an inspection of the lumber yards at Susanville to determine the habits of the roundheaded borer (*Callidium antennatum*) which causes considerable damage to sawn timber from which the edgings have not been cut.

Dr. H. E. Burke completed the summer's work in the Yellowstone National Park and returned to Palo Alto September 18th.

F.P. Keen left Palo Alto September 8 and joined W.J. Buckhorn on the Modoc National Forest. They expect to complete the cooperative survey of the western pine beetle infestation and return to Palo Alto by October 15th.

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Kanab, Utah.

Messrs. W.D. Edmonston and Geo. Hofer are making a survey of the Kaibab Forest to determine the amount of 1926 Black Hills beetle infestation in the yellow pine. They expect to complete this early in October and will go to Tucson Arizona for the winter.

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Ashland, Ore.

During August, Patterson and Buckhorn made a survey of the western pine beetle infestation in the yellow pine on the Klarath Indian Reservation. This survey indicates that the 1926 western pine beetle loss will exceed the 1925 loss by at least 25%. Some sections show the heaviest western pine beetle loss ever seen by the observers.

During September control work against the mountain pine beetle in lodgepole pine in the Crater National Park was continued. The Munson Valley area was recleaned to get the summer infestation and the infested trees on a previously uninfested area just south were treated.

This year's control work in the Park progressed very satisfactorily and the finish of the project appears to be in sight.

J.E. Patterson.

BUPRESTID SWARMING.

While the 750,000 barrel storage tank of the Shell Oil Company was burning at Coalinga, California, during this last August, untold numbers of Melanophila consputa Lec. were attracted to the neighborhood. These were excessively stimulated by the heat and odor of the burning oil and were flying everywhere, often alighting upon individuals, whom they occasionally nipped. I am told by the oil engineers that this is a common occurrence whenever there are big oil fires. The most interesting fact in this case is that Coalinga is in an arid part of the State, and no coniferous trees, the normal food trees of the beetle, are to be found nearer than from fifty to a hundred miles, so that the beetles not only flew that distance, but were able to detect the odors that far off. Fine particles of oil were carried into the upper air strata and deposited at Dinuba, sixty miles away, so it is not surprising that the more volatile principles were carried so far. - Edwin C. Van Dyke in Pan. Pacific Ent.

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GOOD TIMBER.

The tree that never had to fight,
For sun and sky and air and light,
That stood out in the open plain,
And always got its share of rain,
Never became a forest king,
But lived and died a scrubby thing.
The man who never had to toil,
Who never had to win his share
Of sun and sky and light and air,
Never became a manly man
But lived and died as he began.
Good timber does not grow in ease;
The stronger wind the tougher trees;
The farther sky, the greater length,
The more the storm the more the strength.
By sun and cold by rain and snows
In tree or man good timber grows;
Where thickest stands the forest growth
We find the patriarchs of both;
And they hold converse with the stars
Whose broken branches show the scars
Of many winds and much of strife;
This is the common law of life.

- George Mulloch.

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NEWS! NEWS! NEWS!

This is to remind you that we can't publish the news unless you give it to us first. After an arduous day spent in the field you need some recreation. Why not take it by writing down or up the interesting things you have seen in the field. Think of the satisfaction you will have when you have done your full duty and have mailed several sheets of these interesting happenings to the always hopeful and thankful Editor.